



DEPARTMENT OF AGRICULTURE

Notes on

Upper India Hedges

Their Utility and Ornamental
Development

by

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LIST OF ILLUSTRATIONS.

The specific use of hedges in archæological work—

- (a) Hedges made use in the conservation work of Alaudin Khilji's mosque.
- (b) Hedges made use in the conservation work of Alaudin Khilji's college.
- (c) Shapes and cross-section of hedges (a) to (f).
- (d) Ornamental hedge designs (g) to (n).

NOTES ON UPPER INDIA HEDGES.

THEIR UTILITY AND ORNAMENTAL DEVELOPMENT.

HEDGES, ornamental or utilitarian, are an important factor in the disposition of all parks and gardens, whether employed in the formal classic garden, or put to more utilitarian uses for the demarcation of estates or the enclosure of cottages and fields, where they in time become living walls affording protection to cultivation, etc. Hedges are worthy of greater consideration and attention to their selection and welfare than is generally bestowed on them.

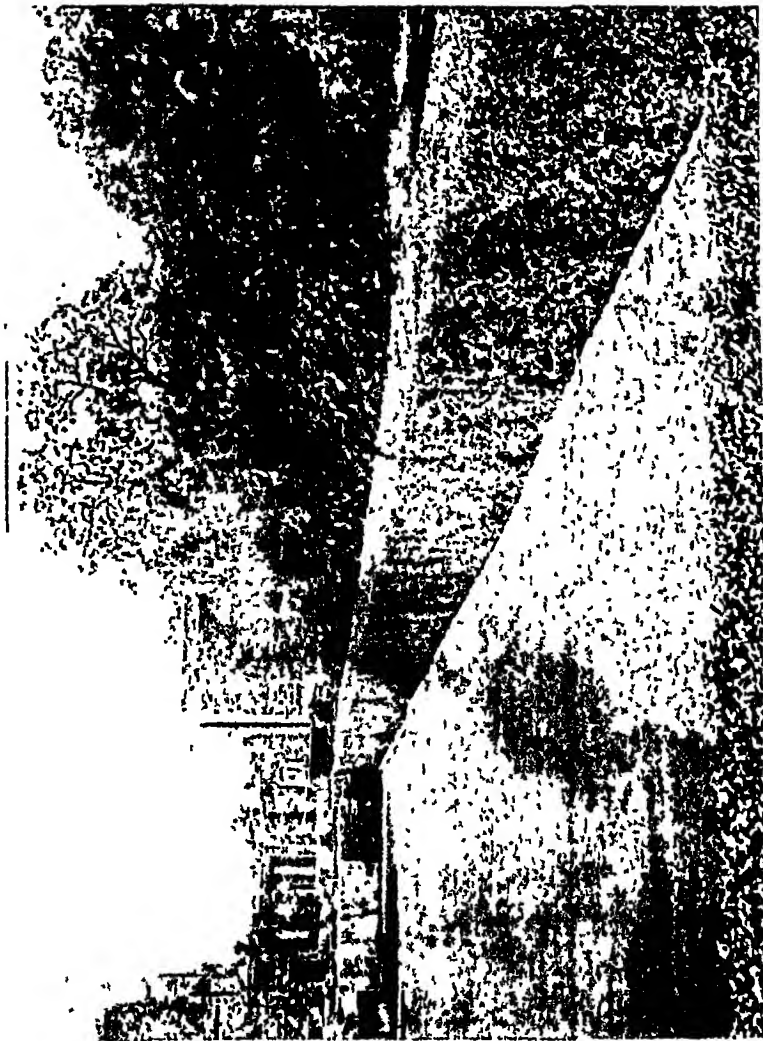
There is an ample evidence that hedges have been employed from the earliest times—long ages before the first conception of the laws-governing landscape architecture. They are in evidence in the earliest European gardens. Lenotre, to whom we owe the inception of the early French school of landscape and gardening architecture, has, in his wonderful conceptions of the parks and gardens of Versailles, made great use of hedges to amplify each of his creations. What would be the setting of his thirteen muses without his world-famed hedges, his labyrinth, his wonderful water effects without their hedges in the back ground? They are to-day what he conceived them to be, the main formation of the formal settings he conceived, their position in relation to each work was evidently carefully worked out.

In India formal gardening is neglected and hedges seldom play the ornamental part they might be made to do. This is doubtless due to the influence of those early Indian gardens, now decayed where formal designs were ill-conceived and applied to a ground "lay-out" without regard to the limitations imposed by considerations of space, size and growth of the vegetation selected.

With the advent of the Great Moghals however, one notices the birth of the architectural formal garden characterized by its stone-paved causeways, platforms, tanks, fountains and masonry watercourses. Their architectural setting and outlines obviously harmonize; but with the limited scope these comparatively small walled-in parterres provide for the vegetation needed to show to the best advantage the monument which they usually adorn, where a large tree would create a setting in harmony with the monument, in most cases it would overpower the parterre in which it was planted.

Formality can be overdone, but it is generally recognized to be the only method by which foreground of residences can be effectively dealt with. It is the judicious blending of the formal and the natural that is such a pleasing feature of our old English gardens, where the surrounding of the residence with its formal setting gradually merge into the natural.

Hedges in India are usually planted as fences to demarcate the compounds of houses and enclosures; to screen undesirable spots and to protect cultivation. Seldom are they developed on ornamental lines in relation to a formal design. In recent years hedges have been successfully employed in some of our archaeological conservation works to re-trace the outlines of extinct structures, colonnades, piers, etc. In this manner the long-vanished outlines of some of our most interesting archaeological relics have been re-established in hedges, notably the Akbari Mahal in the Agra Fort and the perished enclosures of the world-famed courtyards in the Fort at Delhi, which once



Western Wall of Alaudin Khilji Great Mosque, 1300-1315 A.D. [To face page 2.
which was to accommodate the Mehrab (Sanctuary) outlined by hedge.



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Alaudin Khilji's College, Delhi, 1315 A.D.
Hedges outlining the long vanished features of the College.

witnessed all the splendours of the Great Moghal Court. The grounds of the Kutub at Delhi have been similarly treated. Hedges now mark the position of the original colonnades of the great mosque enclosures of Alaudin Khilji taking in the mosque forecourts of the Kutubuddin Aibek and Altamash, and the alignment of the western wall of Alaudin Khilji's great mosque designed to form the outline of the great prayer chamber, the sacred wall which was to accommodate the mohrab or sanctuary of the mosque. Exhaustive excavations have discovered the eastern and northern sides of Alaudin Khilji's college, and the site is now defined in hedge-work which conveys a clear idea of the outlines of those early conceptions. No work of conservation or restoration could have more adequately met these cases.

The foregoing are specific instances in which definite results have been obtained by the scientific application of hedges to the delimitation of the boundaries of archaeological discoveries, and these are further illustrated by the photographs which accompany the notes.

OBJECTION TO HEDGES.

Fault is some times found with hedges because, it is said, they impoverish the soil and starve the plants that grow in their neighbourhood. Where this occurs and hedges actually disturb other vegetation it is obviously due to one or both of the following causes:—

(a) Insufficiently deep trenching of the site of the hedge.

A deep trench induces perpendicular deep root action.

A shallow trench usually results in lateral roots developing to the detriment of the main roots.

These lateral roots occur as a rule just below the surface of the ground and tap the neighbouring soil for their nourishment. Shallow hedges usually suffer in a prolonged drought.

- (b) Restriction of light and air which are indispensable to the well-being of all plant life. If vegetation is attempted close against a hedge, it will be adversely affected both by the lateral root action of the hedge, and by the resulting restriction of light and air.

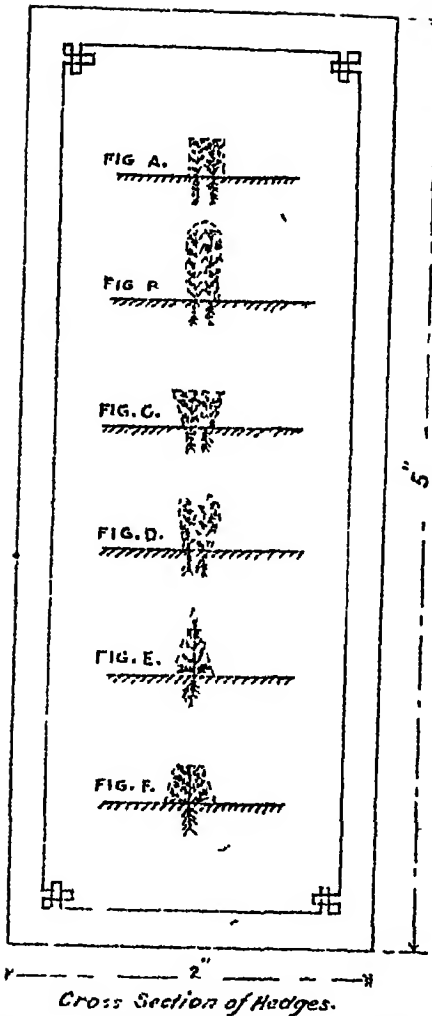
Wherever hedges are introduced, a clear space of from 4 to 6 feet should be left on both sides, before shrubbery or any kind of border is attempted. This neutral strip of ground will admit of the necessary diffusion of light and air besides providing a footpath along the hedge for its proper maintenance.

Hedges also harbour insects and other pests. Their presence depends very much upon the condition of the hedges, for if the latter are of vigorous growth little is to be feared. Their ravages may be warded off by due attention to details as to planting, pruning and the periodical removal of decayed limbs. If hedges are planted as advocated, insecticide emulsions can be readily applied and the trouble localized.

SHAPES OR CROSS-SECTION OF HEDGES.

There are several shapes or cross-sections of hedges and their particular shape greatly depends on the object aimed at. The smaller the hedge is to be, the more imperative is it to aim at a square setting. [See Fig. (a).] It is the one usually preferred by architects, its top being clipped at right angles to the sides; precaution should be taken to develop all lower branches by judicious pruning.

Fig. (b) is similar to Fig. (a), but is suitable for tall hedges; the rounded top is more readily obtained and is easy to control. It is a shape that will appeal to most cultivators aiming at developing the lower lateral branches, the sides



of formal shaped species planted in a single line. It is the most natural section and has been called the Forester's hedge, its natural tendency being to force the lower lateral branches to develop. Such hedges can always be altered and brought to the perpendicular shape as illustrated at (a) and (b).

Fig. (f) speaks for itself. It is the first transformation Fig. (e) is subjected to, and by the removal of the apex the

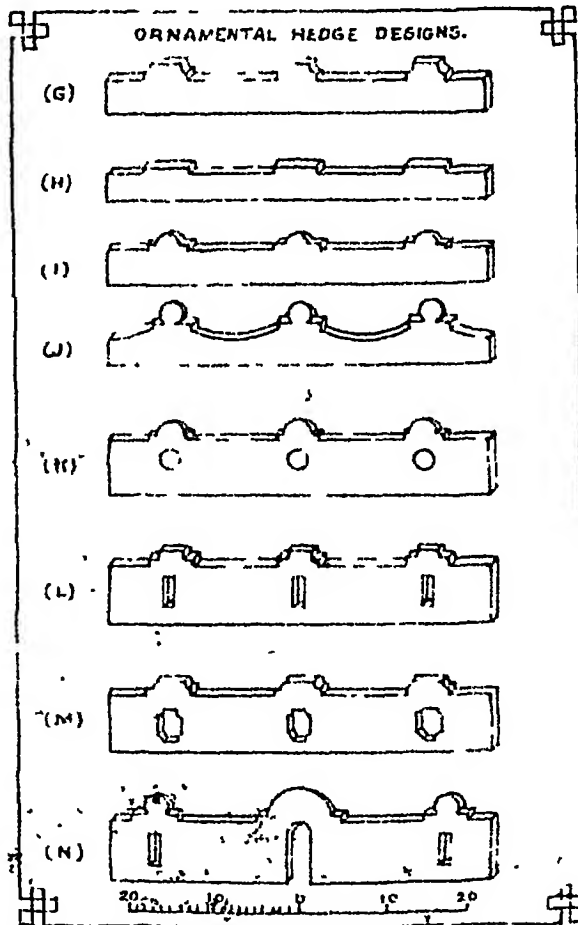
receiving an equal amount of air and light.

Fig. (c) is usually the most natural development of a twin planted hedge when it has not been cut back in its early stages. It will be seen that the top is thriving to the detriment of the base which is gradually being overshadowed by its expanding top. Such hedges often become denuded at their base.

Fig. (d) is the amplification of (c) as (b) is of (a). It is suitable for tall hedges. It should be said this design accentuates the disadvantages of Fig. (c) with regard to the bases and thus deprives it of the characteristic of the hedge.

Fig. (e) or the conical hedge is usually formed

upper lateral branches quickly develop, enabling Figs. (a) and (b) to be easily obtained. For practical purposes these designs will suffice. There are other fanciful and grotesque shapes which properly belong to the old art of Topiary now almost extinct and which do not come within the scope of these notes.



Elevation of ornamental Hedges.

DESIGNS OR ELEVATIONS OF FORMAL DECORATIVE HEDGES.

In the above, the cross-sections or shapes of hedges have been fully dealt with, and it now remains to illustrate the influence modern architecture may have in the formation of ornamental hedges. Figs. (g), (h), (i) and (j) are designs that can be easily obtained and which will adopt themselves admirably to dwarf ornamental hedges bordering a road or thoroughfare, or demarcating a terrace garden, or enclosing an elevated platform.

Figs. (k), (l) and (m) represent ornamental back ground hedges which may frame in a formal garden, sheltering it from high winds, etc. They may equally prove suitable for enclosing stable or garago yards, replacing masonry walls. This particular set of designs will suit hedges from 7 to 9 feet high, providing, if need be, complete seclusion.

Fig. (n) shows to what extent ornamental hedges can be developed. They may be a revival of, or a return to a Topiary renaissance, where fantastic and animal outlines characteristic of the early Topiary art are replaced by architectural outlines. In the development of such hedges, it will be preferable, if possible, to amplify one of the predominating horizontal lines or features of the adjoining residence. In the case of a dwarf hedge, the height of a plinth of a building may be taken. For high hedges, the spring of an arch, the horizontal of a capital or a window, may define a relative height to be aimed at.

In this respect, it may not be out of place to say that the successful development of hedged enclosures lies in the relative scale to the whole. This is where the landscape and garden architect comes in; the law of proportion and harmony must prevail to ensure a complete success. Then again, another factor which cannot be ignored, is the necessity

of providing skeleton frames of the type design selected, to facilitate an accurate training. Such skeleton frames may be made of $\frac{3}{8}$ " or $\frac{1}{2}$ " round iron bars, properly secured so as to govern the defining lines, openings in hedges may be similarly devised by light frames inserted in the growing hedge to ensure uniformity of treatment.

SELECTION AND CLASSIFICATION AS TO THEIR ADAPTABILITIES.

The selection of the most suitable kinds of plants to be made use of calls for careful consideration. In this connection it is necessary to predetermine the kind of hedge required and the effect to be aimed at. And a knowledge of local conditions is equally essential. The following classification should prove helpful in their selection :—

- I.—The dwarf ornamental garden hedge.
- II.—The dwarf armed or protective hedge.
- III.—The tall ornamental garden hedge.
- IV.—The tall armed or protective hedge.
- V.—Wind breaker or shelter hedge.
- VI.—The cactus or railway hedge.
- VII.—The water-logged ground hedge.
- VIII.—The brackish or alkaline land hedge.
- IX.—The flowering hedge.
- X.—The temporary or fast-growing hedge.

Several species will serve equally well for different purposes but the above classification will, so far as Upper India is concerned, enable a suitable selection of hedges to be made.

For convenient reference the foregoing groups are detailed below, their botanical names being shown along with their usual Upper India vernacular equivalents. Also their respective

modes of propagation. The following abbreviations have been adopted :—

C.=	Propagated by cuttings.
B =	Ditto bulbills.
D. R.=	Ditto division of roots.
L.=	Ditto layers.
S.=	Ditto seeds.

I.—DWARF ORNAMENTAL HEDGES.

<i>Clerodendron inerme</i>	... <i>Sang-luppi</i>	... C. D. R. & L.
<i>Dodonaea viscosa</i>	... <i>Rattia</i> or <i>Sanatta</i>	... S.
<i>Duranta Plumieri</i>	... ..	... C. & S.
<i>Justicia Gendarussa</i>	... ..	... C.
<i>Lawsonia alba</i>	... <i>Mehndi</i>	... C. & S.
<i>Myrtus communis</i>	... <i>Wilayati Mehndi</i>	... C. & S.

II.—DWARF ARMED OR PROTECTIVE HEDGES.

<i>Acacia modesta</i>	... <i>Phola</i>	... S.
<i>Citrus vulgaris</i>	... <i>Khatta</i>	... S.
<i>Clerodendron phlomoïdes</i>	... <i>Urni</i>	... C. & D. R.
<i>Duranta spinosa</i>	... Armed species	... C. & S.
<i>Inga dulcis</i>	... <i>Wilayati Babool</i>	... S.

III.—TALL ORNAMENTAL HEDGES.

<i>Duranta Plumieri</i>	... ..	... C. & S.
<i>Lawsonia alba</i>	... <i>Mehndi</i>	... C. & S.
<i>Murraya exotica</i>	... <i>Marchula</i>	... C. & S.
<i>Myrtus communis</i>	... <i>Wilayati Mehndi</i>	... C. & S.
<i>Polyalthia longifolia</i>	... <i>Asok</i>	... S.
<i>Thevetia neriifolia</i>	... <i>Pila Kaner</i>	... S.

IV.—TALL ARMED OR PROTECTIVE HEDGES.

<i>Acacia Farnesiana</i>	... <i>Wilayati Kikar</i>	... S.
<i>Carissa Carandas</i>	... <i>Karaundz</i>	... S.
<i>Caparis sepiaria</i>	... <i>Hum garna</i>	... S. & C.
<i>Citrus vulgaris</i>	... <i>Khatta</i>	... S.
<i>Diospyros montana</i>	... <i>Pasendu</i>	... S.
<i>Inga dulcis</i>	... <i>Wilayati Babool</i>	... S.

V.—WIND BREAKERS OR SHELTER HEDGES.

Bambusa of sorts	... <i>Bans</i>	...	... C. & S.
Citharexylon subserratum	Fiddle wood	...	... C.
Parkinsonia aculeata	... <i>Wilayati Kikar</i>	...	... S.
Prosopis Juliflora	... <i>Mesquite</i>	...	... S.
Salix tetrasperma	... <i>Badha</i>	...	... C.
Sesbania aegyptiaca	... <i>Jaint</i>	...	... S.
Tamarix articulata	... <i>Farash</i>	...	... C.

VI.—CACTUS, FIELD OR RAILWAY HEDGES.

Agave americana	... <i>Kakas pattah</i>	...	... B.
„ vivipara	... <i>Khethi</i>	...	... B.
Euphorbia Royleana	... <i>Thor</i>	...	... C.
Furcraea gigantea	...	...	... B.
Opuntia Dillenii	... <i>Nagphan</i>	...	... C.

VII.—WATER-LOGGED OR SWAMPY GROUND HEDGES.

Bambusa of sorts	... <i>Bans</i>	...	... C. & S.
Salix babylonica	... <i>Bisa</i>	...	... C.
„ tetrasperma	... <i>Badha</i>	...	... C.
Samarix gallica	... <i>Jhau</i>	...	... S.

VIII.—BRACKISH LAND HEDGES.

Agave americana	... <i>Khas pattah</i>	...	... B.
„ vivipara	... <i>Khethi</i>	...	... B.
Clorodendron inerme	... <i>Sang-huppi</i>	...	... C. & L.
Citrus vulgaris	... <i>Khatta</i>	...	... S.
Euphorbia Royleana	... <i>Thor</i>	...	... C.
Dodonaea viscosa	... <i>Ratha or Sonatta</i>	...	... S.
Inga dulcis	... <i>Wilayati Babool</i>	...	... S.
Lawsonia alba	... <i>Mehndi</i>	...	... C & S.
Parkinsonia aculeata	... <i>Wilayati Kikar</i>	...	... S.
Prosopis juliflora	... <i>Mesquite</i>	...	... S.
Opuntia Dillenii	... <i>Nagphan</i>	...	... C.
Thevetia nerifolia	... <i>Pila Kaner...</i>	...	... S.

IX.—FLOWERING HEDGES.

Baninia acuminata	... <i>Kachnar</i>	...	... S.
Hibiscus of sorts	...	...	... C.
Jasminum sambac	... <i>Mugra</i>	...	... C. & D R.
Murraya exotica	... <i>Marchula</i>	...	... C. & S.
Tecoma stans	... <i>Yellow Elder</i>	...	... S.

X.~ TEMPORARY OR FAST-GROWING REDGES.

<i>Cajanus indicus</i>	... <i>Dhul</i>	...	... S.
<i>Sesbania aegyptiaca</i>	... <i>Jaint</i>	...	... S.
<i>Tamarix gallica</i>	... <i>Jharu</i>	...	... S.

As a résumé to facilitate references, the above 10 classes have been placed in two distinct groups, one mostly suitable for dry environments and the other for moist tracts.

GROUP (a)—SUITABLE FOR DRY POSITIONS.

<i>Acacia Farnesiana</i>	...	...	... <i>Wilayati Kikar.</i>
„ <i>modesta</i>	...	...	... <i>Phola.</i>
<i>Agave americana</i>	...	...	... <i>Rakas pattah.</i>
„ <i>vivipara</i>	...	...	... <i>Khetki.</i>
<i>Caparis sepiara</i>	...	...	... <i>Kum-garna.</i>
<i>Carissa Carandas</i>	...	...	... <i>Karaunda.</i>
<i>Citrus vulgaris</i>	...	...	... <i>Khatta.</i>
<i>Clerodendron inerme</i>	...	...	... <i>Sang-huppi.</i>
„ <i>phlomoides</i>	...	...	... <i>Urni.</i>
<i>Dodonaea viscosa</i>	...	...	... <i>Rallia, sanatta.</i>
<i>Euphorbia Royleana</i>	...	...	... <i>Thor.</i>
<i>Drospyros montana</i>	...	...	... <i>Pasendu.</i>
<i>Inga dulcis</i>	...	...	... <i>Wilayati Babool.</i>
<i>Lawsonia alba</i>	...	...	... <i>Mehndi.</i>
<i>Parkinsonia aculeata</i>	...	...	... <i>Wilayati Kikar.</i>
<i>Prosopis juliflora</i>	...	...	... <i>Mesquite.</i>
<i>Opuntia Dillenii</i>	...	...	... <i>Nagphan.</i>
<i>Tamarix articulata</i>	...	...	... <i>Farash.</i>
<i>Tecoma stans</i>	...	...	... <i>Yellow Elder.</i>
<i>Thevetia neriifolia</i>	...	...	... <i>Pila Kanor.</i>
<i>Sesbania aegyptiaca</i>	...	...	... <i>Jaint.</i>

GROUP (b)—SUITABLE FOR MOIST TRACTS.

<i>Bambusa</i> of sorts	...	...	... <i>Buns.</i>
<i>Bauhinia acuminata</i>	...	...	... <i>Kachnar.</i>
<i>Duranta</i> of sorts	...	...	...
<i>Hibiscus</i> of sorts	...	...	...
<i>Jasminum sambac</i>	...	...	... <i>Mugra.</i>
<i>Justicia Gendarussa</i>	...	...	...
<i>Murraya exotica</i>	...	...	... <i>Murchula.</i>

GROUP (b)—SUITABLE FOR MOIST TRACTS—(concluded).

<i>Polyalthia longifolia</i>	...	...	... <i>Asch.</i>
<i>Salix babylonica</i>	...	...	... <i>Bisa.</i>
„ <i>tetrasperma</i>	...	...	... <i>Batha.</i>
<i>Sesbania aegyptiaca</i>	...	...	... <i>Jaint.</i>
<i>Tamarix gallica</i>	...	...	... <i>Jhau.</i>

TEMPORARY VERSUS PERMANENT HEDGES.

In the present age of evolution when cities and gardens have to rise simultaneously, every effort is directed to the attainment of an immediate result. Fast-growing trees, shrubs and hedges have to be produced to cope with the rapidity of the builders, and this has led to a great deal of temporary work which has to play its part till more permanent features can be established.

Time being the all-important factor, the selection of a fast-growing species for immediate planting as a temporary hedge is essential. This should not occupy the permanent hedge alignment, but be placed a few feet away, to enable the permanent hedge to be grown in its allotted place.

Fast-growing hedges, like fast-growing trees and shrubs, have a comparatively limited span of life. It is imperative therefore that the planting of the permanent species should not be delayed.

The number of fast-growing species that are suitable for the purpose is limited to three, and each of these has its own scope. The dwarf demarcating hedge is limited to *Cajanus indicus* or "Dhal" which creates a serviceable hedge within a comparatively short time, a height of 3 feet may be obtained in as many months but it will not adapt itself to anything beyond this.

The taller or screen hedge can only be obtained with *Sesbania aegyptiaca*, commonly known as *jaint*. If sown

in the spring or as soon as fresh seeds are obtainable, or at the beginning of the rains, a hedge 5 to 6 feet high can be obtained in the first year. Next comes the water-logged sub-soil hedge or screen which is a semi-aquatic species of *Tamarix*—*T. gallica*—known in Upper India as *jhan*, seeds sown in the spring, or young self-sown saplings transplanted during the rains, will easily reach a height of 8 feet in the first year: it has, however, the drawback of being deciduous in the second year and soon becomes woody.

PLANTING AND PROPAGATION HINTS.

Hedges, whether temporary or permanent, require the same precautions and treatment, and their success greatly depends on the proper preparation of the soil. The main object of planting hedges is to obtain a uniformity of growth which will insure the result aimed at; whether it be a decorative hedge, a protective fence or a wind-breaking belt; for their ultimate success it is obvious that uniformity of treatment from the outset is imperative if disfigurement from blanks or gaps is to be avoided.

It is therefore essential not only to trench the site to be so treated but to dig down to a depth varying from 2 to 2½ feet placing the earth along side the trench. The trench sub-soil should then be turned over to a depth of another foot so as to loosen it, the harder or heavier the soil, the more imperative is this.

If well decomposed manure is obtainable, a small layer should be placed at the bottom of the trench before re-filling it, care being taken to leave a shallow depression to admit of ready irrigation confined to the actual hedge area. Such trenches should be well watered before planting so as to settle the ground, this is most important when hedges are grown from seeds.

hedges may be pruned at almost any period of their growth, whilst the hard-wooded species are best pruned when the season's wood has matured.

In the case of young dwarf hedges, it is preferable to cut them back to 9 to 12 inches from the ground the first year, to induce vigorous growth of their lower lateral branches, and if this is not done, it will be found difficult to obtain that dense base foundation which constitutes the main feature of a well-grown hedge.

For trimming and finishing the garden hand shears is the most appropriate tool. When dealing with the hard-wooded species the secateur and the lopping shears are needed, but in the case of old hedges the pruning saw and knife are necessary, specially in the annual cutting back when the wood is fully matured, or when renovating an old hedge.

Watering.—In India in general and Upper India in particular little attention is paid to watering. Hedges are watered periodically whether they need it or not, and the result is usually to create an excess of moisture in the sub-soil which the plants are unable to assimilate.

As a general rule watering must be partially suspended when the plants have matured their wood. It is but a law of nature that a period of rest is essential to every plant. If one studies how most of the plants made use of actually grow in their natural habitat one is struck by the treatment they are at times made to undergo. To take an example. One of the most common hedges of Upper India, *Dodonaea viscosa*, which grows on the arid slopes of the Himalayas up to almost 4,000 feet elevation and is exposed to a period of drought extending over several months, is usually grown in the plains under conditions so totally different that it is not surprising that *Dodonaea* hedges often perish before their allotted span of life is reached.

The period of rest in plants varies greatly, but, as already stated, it generally takes place after the maturity of the seeds

and lasts till young shoots break forth. This means that once the seeds have matured watering should for a time be reduced or partially suspended, so as to accentuate the period of rest till nature causes a revival, when watering can be resorted to copiously.

Over-watering of hedge plants invariably induces shallow root action. The main roots do not reach the sub-soil moisture and so long as this condition prevails a hedge capable of successfully resisting a period of drought cannot be produced.

OTHER INDIAN HEDGES.

The enumeration of hedge plants given in these notes represents, more or less, all the species utilized in Upper India. Owing, however, to the diversity of climate found in India, other species are frequently being made use of. The following survey, for which I am indebted to the courtesy of the officers in charge of Government, Municipal and State gardens throughout India, conveys an idea of how the several plants, which would thrive but indifferently in Upper India, are giving satisfaction under different climatic conditions :—

In Bengal, our hedges are represented by *Dodonaea*, *Duranta*, *Inga dulcis*, *Murraya*, *Lawsonia* and *Sesbania*. *Bryophyllum*, *Erythrina*, *Hibiscus sinensis* and *Schizopetalus*, *Polyalthia* and *Sapium* are also being utilized.

In Bihar and Orissa *Acacia Farnesiana* and *Citrus* represent our hedges, *Jacquinia ruscifolia* and *Euphorbia antiquorum* are successfully grown.

In the North-West Frontier Province *Citrus*, *Dodonaea* and *Duranta* are quite common, and *Acacia arabica* is also made use of.

In the Central Provinces *Dodonaea*, *Duranta*, *Inga dulcis* and *Sesbania* are grown as in Upper India, *Galpinia nitida* and *Haematoxylon campechianum* have proved useful as ornamental hedge plants.

In Gwalior, besides *Dodonaea*, *Duranta*, *Inga dulcis*, *Lawsonia* and *Murraya*,—*Bambusa*, *Hibiscus*, *Acalypha*, *Casuarina* and *Ixora* are employed.

In the Bombay Presidency our Upper India hedges are only represented by *Duranta*, *Inga dulcis*, *Lawsonia* and *Murraya*, whilst *Acalypha*, *Bougainvillea*, *Phyllanthus* and *Strobilanthes* are successfully used.

In Mysore we find a much greater diversity. Our hedges are mostly represented by *Clerodendron*, *Dodonaea*, *Duranta*, *Inga dulcis*, *Lawsonia* and *Murraya*, whilst *Acalypha*, *Bougainvillea*, *Casuarina*, *Cupressus*, *Hibiscus*, *Hamelia*, *Ligustrum*, *Pedilanthus*, *Plumbago*, *Meyania* and *Thuja* are made use of.

In Madras hedges seem to be limited to fewer species. *Casuarina* and Madras thorn are the kinds usually resorted to.

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